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HUGHES AIRCRAFT COMPANY
FULLERTON, CALIFORNIA

30 July 1963

BI-MONTHLY PROGRESS REPORT

ON

COLLECTIVE PROTECTION EQUIPMENT

FOR THE

AN/MSG-4 SYSTEM

PHASE II AND III

DEVELOPMENT, FABRICATION AND TEST

CONTRACT NO: DA 18-108 CML-6618 (AMC 28A)

REPORT PERIOD: Technical Report, 1 May to 30 June 1963
(8th Report)TO: Commanding Officer
U. S. Army Chemical Research and
Development Laboratories
Edgewood Arsenal, Maryland

ATTENTION: Contract Project Officer

PHASE II AND III

The Phase II Contract, executed September 1962, authorizes the continued development of Collective Protection Equipment and further provides for delivery of additional items of related equipment and the performance of services encompassing the activities of Maintenance Engineering, Value Engineering, and Data Submittal.

Phase III executed by Contract Modification No. 7, 19 June 1963 authorizes: (1) a feasibility study to evolve optimum designs of Collective Protection (CBR) equipment for the Radar Tracking Station, OA-2952/65Q, the Missile Integration Terminal Equipment, AN/TSQ- (), and the Maintenance Shelter, AN/GSM-44, (2) modification of AN/MSG-4 Vehicles and Shelters to permit installation of Collective Protection equipment for engineering/service tests, and (3) the fabrication of air leakage reduction kits.

GENERAL

During this reporting period, effort was devoted primarily to the following items of work:

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GENERAL (Continued)

1. Fabrication of Protective Entrances for AN/MSQ-18 OC/CDG Vehicles, AN/MPS-23 RET, AN/MSM-34, and AN/MEW-55 Vehicles, AN/GSS-1D Shelter, AN/TSQ-38 OC/CDG Shelters, and AN/MSQ-28 WMD/RDPC Vehicles.
2. Fabrication of four additional skid bases and storage boxes.
3. Fabrication and simulated installation of Vehicle Modification Kits and OPE System Installation Kits.
4. Resolution of Protective Entrance door design problem.
5. Resolution of motor overload protection problem.
6. 400 CFM Filter Unit additional high and low temperature testing.
7. 400 CFM Filter Units and control panels acceptance testing.
8. AN/MSQ-18 Vehicle and AN/GSS-1D Shelter air leakage testing completion.
9. Preparation of 400 CFM Filter Unit Purchase Description.

CUSTOMER COORDINATION

1. CRDL representatives M. Mears, W. Linkous, and J. Maxa visited HAC on 8 and 9 May to inspect the latest working model of the protective entrance quick closing door. It was decided that additional development work should be accomplished to eliminate the tendency for the air leakage rate through the door to vary with repeated door usage.
2. CRDL representatives M. Mears, L. Valcarenghi and W. Linkous visited HAC on 11 and 12 June to review program status and to inspect the final working model of the quick closing door. The following decisions were made at that time:
 - a. Stop work on the quick closing type door and proceed with design of an air lock type entrance with slide fasteners for both doorways.
 - b. Incorporate a thermostatic switch in the blower motor to signal an unsafe motor winding temperature in lieu of other types of motor protection that could possibly result in nuisance tripping.
 - c. Permission was granted to use on-hand power and control cables suitable for service at -40°F during field tests. HAC production cable drawings will specify cable suitable for service at -65°F.
 - d. All AN/GSS-1D design work except Protective Entrance will continue to be delayed until system design direction is provided by CRDL.

CUSTOMER COORDINATION (Continued)

- e. A field type modification kit to reduce air leakage will be designed for the AN/MSQ-18 air conditioner.
- f. Nomenclature formerly supplied HAC by CRDL has not been officially approved and is subject to modification. HAC will make revisions to drawing titles and equipment nameplates only after approved nomenclature is received.
- 3. E. Brodie and V. Dorage of HAC visited Edgewood Arsenal on 27 and 28 June for conferences regarding HAC prepared Purchase Descriptions. The following requirements were agreed upon:
 - a. Purchase Descriptions to be prepared:
 - (1) Filter Unit, Gas-Particulate, EMD, 400 CFM
 - (2) Control Box, Gas-Particulate Filter Unit
 - (3) Filter, Gas, 100 CFM
 - (4) Filter, Particulate, 400 CFM
 - (5) Protective Entrance (all inclusive)
 - (6) Instrumentation and adjustment kit
 - b. HAC will prepare Purchase Descriptions to identify Collective Protection Equipment components required for each of the AN/MSG-4 sub-systems listed below:
 - (1) AN/MSQ-28 WMC/RDPC
 - (2) AN/MSM-34
 - (3) AN/MSM-55
 - (4) AN/MPS-23 RET
 - c. HAC Parts Control Drawings will serve as Purchase Descriptions for the blower unit, pressure switch, motor starter and other similar components.
 - d. A Filter Unit in level A packaging and packing will not be required for rough handling test. A filter unit or updated blower unit is to be furnished CRDL for additional environmental testing.

DESIGN PROGRESS

1. 400 CFM Filter Unit

- a. A thermostatic switch has been selected to be installed in the blower motor. The switch will light the existing "blower malfunction" lamp on the control panel when the motor windings exceed a safe operating temperature. This feature, used in conjunction with "quick-trip" type overload heaters in the motor starter, should give adequate motor protection and avoid the possibility of nuisance tripping.
- b. The control wiring has been re-designed to permit damper motor operation without first starting the blower motor.
- c. The wiring harness has been re-designed to accommodate the above modifications.

2. Protective Entrance

In accordance with CRDL instructions, a new type entrance is being designed using a fabric air-lock entrance chamber with slide fastener doorways. The new design incorporates:

- a. A tapered bottom section rather than an accordian section to provide for variations in ground level.
- b. Blackout flaps over the inside surfaces of the windows,
- c. Four pairs of webbing straps for support of Government furnished clothing and decontamination pouches.

DRAWING PROGRESS

1. 400 CFM Filter Unit

Completion and release of the wiring changes have been accomplished.

2. Air Leakage Reduction Procedure Drawings for vehicles and shelters are 90% complete, and for the AN/MSQ-16 System air conditioner are 50% complete.

3. Protective Entrance

The up-dated Protective Entrance drawings for AN/GSS-1D and AN/TSQ-38 CC/CDG Shelters will be released for fabrication 8 July with completion of Protective Entrance drawing release scheduled for 22 July 1963.

FABRICATION PROGRESS

1. Fabrication of all Protective Entrances incorporating the air-lock principle is approximately 50% complete.
2. Four additional skid bases and storage boxes have been fabricated and await final painting.
3. Five final prototype 400 CFM Filter Units have been fabricated and tested. These Filter Units incorporate the baffles and new cover tie-down springs. Incorporation of blower motor thermostatic switches remains to be done.
4. Six blower unit motors have been retrofitted with bearings suitable for operation at -65°F. The additional two blower units will be retrofitted upon receipt from CRDL.
5. New pressure gages suitable for -65°F service have been installed in six (6) control boxes.
6. Vehicle Modification Kit hardware for all systems is complete.
7. Installation Kit hardware for all systems is approximately 95% complete.

TEST PROGRESS

1. Protective Entrance

Several variations of the CRDL quick closing type door were constructed and tested. The best arrangement proved to be one which made use of mechanical clasps to restrain the door from bowing outward upon pressurization of the Protective Entrance. The final model demonstrated to CRDL representatives still exhibited inability of the entrance to return to the same pressure after each operation of the doorway. Since pressure variations will affect the entire system, the design was determined unsatisfactory. The decision was made to concentrate effort on the development of a Protective Entrance incorporating an air lock and utilizing slide fastener doorways in both the air lock and main body sections.

2. 400 CFM Filter Units

- a. The standard motor overload heaters were tested to determine the change in rating as ambient temperatures decreased from +125°F to -65°F. The test revealed that overload protection decreased as the ambient operating temperature decreased becoming unsatisfactory before reaching minimum low temperature.

TEST PROGRESS (Continued)

a. Continued

Dual element fuses were tested for suitability as a more effective means of protection. Catalog rating indicated the desired characteristics, but tests were completely unsatisfactory. Test current required to open the fused circuit varied as much as 200% from the rated value.

The decision was then made to augment the heater element method of protection with a thermostatic switch mounted in the blower motor to signal abnormal motor temperatures. Standard heater elements and "quick trip" heater elements were tested at -65°F to determine the comparative locked rotor current trip time. The "quick trip" heater was selected for use because it will provide the greatest degree of motor protection.

b. The five final prototype units were tested for performance requirements. The test consisted of adjusting the pressure switch, checking the damper motor speed and damper travel, determination of the maximum delivery pressure with all dampers full open, confirmation of satisfactory operation during the automatic mode, and check-out of the control panel. Additional spot testing will be required after the blower motors are re-installed following addition of the thermostatic motor protection by the vendor. The acceptance testing revealed the following:

- (1) All units demonstrated satisfactory operation both at maximum air delivery and in the automatic mode.
- (2) The maximum air delivery test indicated increased performance over that of the Test and Evaluation Prototypes, following a vendor modification to the blower inlet design.
- (3) A previously reported excessive pressure drop due to the inlet plenum baffle was determined to result from an improper test set-up. It was not duplicated in latter tests.
- (4) A motor bearing problem appeared near the conclusion of a test of one filter unit. The vendor is taking corrective action at the same time the motor is being fitted with a thermostatic switch.

c. High and Low Temperature Test

Following vendor replacement of motor bearings with low temperature lubricant, high and low temperature tests were repeated with satisfactory results.

3. Control Panel Pressure Gages

The original pressure gages furnished by the vendor did not operate properly throughout the specified temperature range. Replacement gages were supplied and tested and were found to operate satisfactorily throughout the entire temperature range of +125°F to -65°F.

4. Installation Kits

Trial installations were made with the appropriate kits on AN/MSQ-28 RDPO, AN/MPS-23 RAT, AN/MSQ-18 OC and CDG (outside only), and AN/TSQ-38 OC and CDG (outside only) unmodified vehicle/shelters. Necessary minor corrections are being incorporated in Kit hardware.

5. Vehicle Air Leakage Tests

Air leakage tests were completed on an AN/MSQ-18 CDG Vehicle at Fort Bliss and on an AN/GSS-1D Shelter located at HAC. The AN/MSQ-18 test revealed that the major air leakage sources are located in the air conditioner and extensive modification will be required to bring the leakage rate within limits. The AN/GSS-1D Shelter proved to be relatively leakproof after sealing the louvres.

MAINTENANCE ENGINEERING

Shipment of final manuscripts is expected by 12 July 1963 on all of Contract Item 7 except the maintenance engineering requirements applicable to the AN/GSS-1D and design changes presently in process.

VALUE ENGINEERING

1. As a result of a change in report content and schedule of reporting, Value Engineering effort has been centered on a rewrite of study reports on the Skid Base and Storage Box for submittal to the customer. The rewrite of the study reports is being made in accordance with an outline verbally approved by the customer.
2. Recommended design changes have been illustrated by means of line drawings and "exploded" views.
3. The Value Engineering study on the Protective Entrance which was nearing completion has been postponed pending drawing release for Protective Entrances utilizing the air lock principle.

ELECTRONIC COMPONENT DEVELOPMENT

No electronic components were developed during this reporting period.

FINANCIAL SUMMARY

The funds expended, manhours expended, estimated costs for the next reporting period, and the balance of contract funds are shown in the following chart. Dollars shown exclude fee.

FINANCIAL SUMMARY (Continued)

May and June 1963		Cumulative Costs Through June 1963		Estimated For July & Aug. 1963	
Man Hours	Total \$ Including Material	Man Hours	Total \$ Including Material	Man Hours	Total \$ Including Material
11,474	\$135,812	69,573	\$794,617	4,850	\$57,473
Contract Cost Funds			\$1,105,008		
Less Cumulative Costs			794,617		
Balance Remaining			\$ 310,391		

PLANNED ACTIVITY FOR NEXT REPORTING PERIOD

1. Completion and release of all drawing changes incorporating the air-lock type of protective entrance.
2. Completion of fabrication of five protective entrances.
3. Completion of 400 CFM Filter Unit motor thermal protection and wiring changes.
4. Re-assembly and single point acceptance re-test for final prototype 400 CFM Filter Units.
5. Two blower units from CRDL will each be equipped with a thermostatic switch and bearings suitable for low temperature operation.
6. Shipment to CRDL of one 400 CFM Filter Unit or two up-dated blower units (to retrofit Phase IA 400 CFM Filter Unit) for additional CRDL environmental testing.
7. Shipment of retrofit kits to update two Phase IA 400 CFM Filter Units at CRDL with the following:
 - a. Air baffle
 - b. Cover replacement tie-down springs
 - c. Replacement overload heaters

PLANNED ACTIVITY FOR NEXT REPORTING PERIOD (Continued)

- d. Additional auxiliary switch for motor starter
- e. Replacement wiring harness
- f. Replacement control box pressure gage

8. Final determination of weights and cubage of installation kit components.
9. Completion of air leakage drawings, procedures and fabrication of kits.
10. Value Analysis report outline will be completed on the Skid Base, Storage Box, Filter Unit and Control Box for customer submittal.
11. Completion of Purchase Descriptions.
12. Initiate the feasibility study of Collective Protection equipment requirements for the RTS, MITE and AN/GSM-44.

HUGHES AIRCRAFT COMPANY
Ground Systems Group

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